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Diurnal Body Temperature Cycle in the Northern Hawk-Owl (*Surnia ulula*)

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The general topic of body temperatures in birds has been reviewed by Wetmore (1921), Baldwin and Kendeigh (1932) and most recently by Dawson and Hudson (1970). Their work has shown that body temperature depends on activity level, thermal stress (Chaplin et al. 1984, Dawson and Hudson 1970), nutritional state (Chaplin et al. 1984), and body size (McNabb 1966). Time of day may also be important since body temperatures can be from 1–8°C higher during the waking phase of a bird's daily cycle even when inactive (King and Farner 1961, Dawson and Hudson 1970). Most species of owls which have been considered to date show the reversed diel cycle, with highest body temperatures at night, typical of nocturnal species (Trost 1963, Siegfried et al. 1975, Wijnandts 1984). I report here data on the daily temperature cycle of the Northern Hawk-Owl (*Surnia ulula*), a diurnally active strigiform bird.

Body temperature (Tb) was measured on a single captive adult female Northern Hawk-Owl. All Tb were measured with a small bulb mercury thermometer. Readings were taken to the nearest 0.1°C with the bulb inserted approximately 11 mm into the cloaca (cloacal) or approximately 2.5 cm into the large intestine (core). Tb were recorded at the start of each hour throughout the day and night between February and April with at least 2 hr between readings. The owl was maintained at ambient indoor temperatures and local photoperiod on a weight maintaining diet.

A total of 109 cloacal Tb were obtained, 73 of which were daytime values (0800–1900 H) and 29 were nighttime values (2100–0600 H); an additional 7 values were obtained in the transition hours of 0700 and 2000 H. The overall mean Tb was 39.4°C ± 0.59 SD (range 38.4–40.8). Mean daytime Tb was 39.6°C ± 0.42 (38.4–40.8) and mean nighttime Tb was 38.8°C ± 0.24 (38.4–39.5) (Fig. 1). The 0.78°C difference between mean daytime and mean nighttime Tb was statistically significant ($T = 8.67$, $P < 0.001$). A total of 64 core temperatures taken nearly simultaneously with the cloacal temperatures averaged 0.91°C ± 0.32 higher. The cloacal and core Tb reported here are generally similar to those reported for a number of owl species (King and Farner 1961, Trost 1963, Dawson and Hudson 1970, McNabb 1966, Ligon 1969, Siegfried et al. 1975) but differences in measurement precedures preclude a more detailed comparison.

Several authors (Mikkola 1983, Johnsgard 1988, Huhtala et al. 1987) have reported that the Northern Hawk-Owl is typically active during the daylight hours as judged from observed prey captures and chick feeding bouts. Thus the higher Tb recorded for this owl during the daytime is related to its diurnal activity phase as previously noted for an array of non-strigiform species (King and Farner 1961, Dawson and Hudson 1970). It has been suggested that endogenous factors may influence the timing of the diurnal temperature cycle in birds (Whittow 1976). However, the Tb of this owl seemed more directly related to its activity level than to the exact time of day. Similarly, hourly variation in Tb did not directly correspond to the daily pattern of change in ambient temperatures which generally increased more slowly throughout the morning, reached a distinct peak between 1400–1700 H, and gradually declined thereafter (Fig. 1).

A diel temperature cycle similar to that observed here for the Northern Hawk-Owl was noted in the Snowy Owl (*Nyctea scandiaca*; Siegfried et al. 1975) and Burrowing Owl (*Athene cunicularia*; Coulombe 1970), both of which are also diurnally active species. Gessaman (1978), however, failed to detect any diel cycle in the Snowy Owl in his subsequent study. A reversed cycle with higher nighttime Tb has been noted for the Barred Owl (*Strix varia*; Siegfried et al. 1975, Trost 1963), Long-eared Owl (*Asio otus*; Wijnandts 1984) and Barn Owl (*Tyto alba*; Trost 1963), three nocturnally active species. Great Horned Owls (*Bubo virginianus*) which are most active near dawn and dusk showed peak Tb at these times and lower Tb during both diurnal and nocturnal times of reduced activity (Siegfried et al. 1975, Chaplin et al. 1984).

There is a paucity of information on body temperature and its physiological correlates, heart rate and metabolism, for birds of prey, and owls in particular. Further work would clearly contribute to our overall understanding of the metabolic needs of these birds and its relationship to habitat management programs currently being formulated for them.

Resumen.—La temperatura corporal media (Tcm) de una lechuza hembra de la especie *Surnia ulula* fue de 39.4°C ± 0.59 (DS). La Tcm diurna fue 0.78°C más alta que la Tcm nocturna, y la Tcm interna fue 0.91°C más alta que la Tcm cloacal. El ciclo diario en la Tcm estuvo vinculado con la fase activa diurna de esta lechuza, pero no tuvo relación aparente con factores endógenos.

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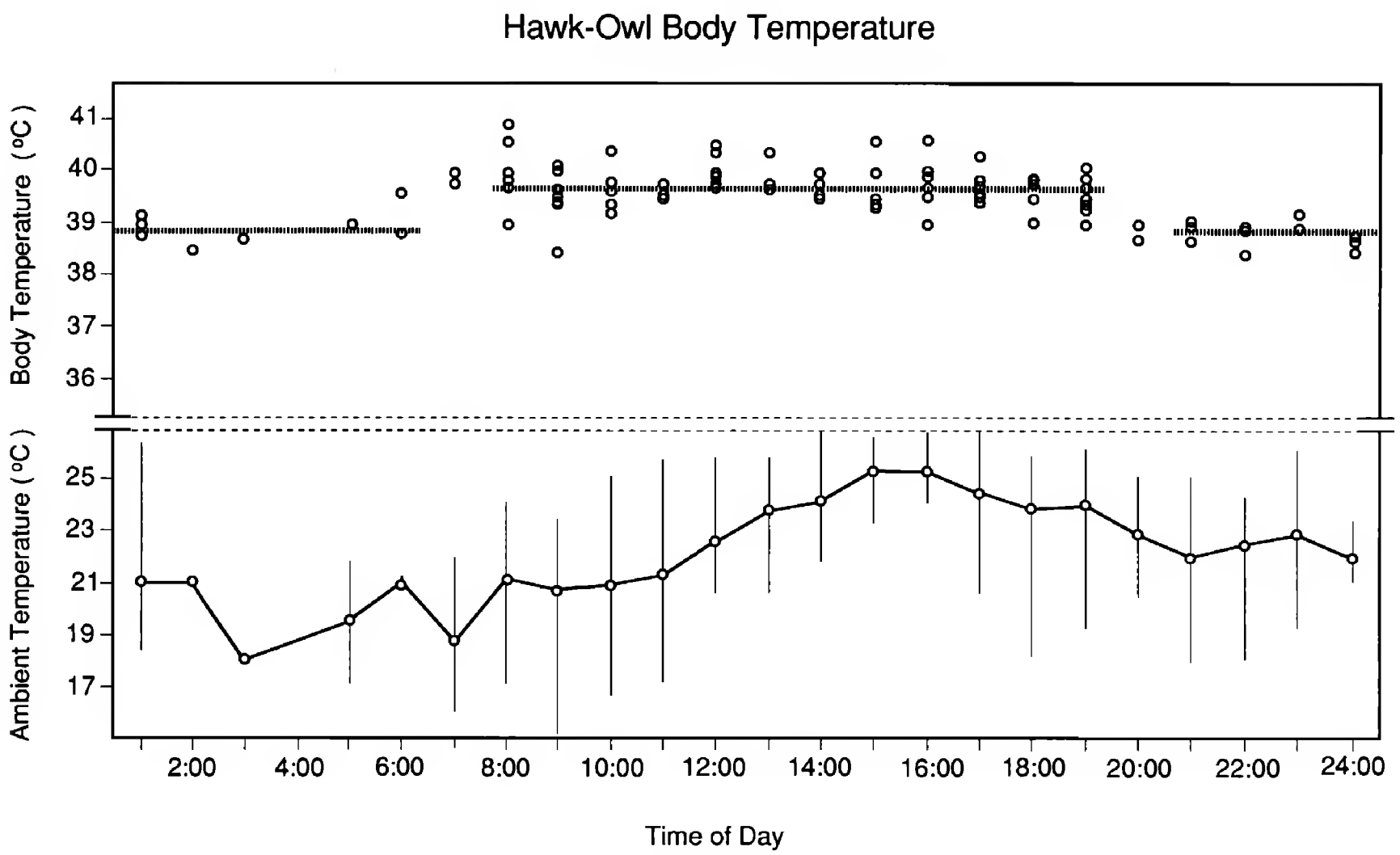

Figure 1. Ambient temperature and daily body temperature pattern for a captive Northern Hawk-Owl. Horizontal lines represent mean body temperature for nocturnal and diurnal portions of daily activity pattern.

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